

CLAIMS

1. A gallium nitride compound semiconductor light-emitting device including a substrate, an n-type semiconductor layer, a light-emitting layer, a p-type semiconductor layer, a negative electrode provided in contact with the n-type semiconductor layer, and a positive electrode provided in contact with the p-type semiconductor layer, the layers being successively provided atop the substrate in this order and being composed of a gallium nitride compound semiconductor, wherein

the positive electrode includes at least a contact metal layer which is in contact with the p-type semiconductor layer,

the contact metal layer comprises at least one metal selected from the group consisting of Pt, Ir, Rh, Pd, Ru, Re, and Os, or an alloy containing said at least one metal, and

the surface portion of the p-type semiconductor layer on the positive electrode side includes a positive-electrode-metal-containing layer that contains at least one metal selected from the group consisting of Pt, Ir, Rh, Pd, Ru, Re, and Os.

2. A gallium nitride compound semiconductor light-emitting device according to claim 1, wherein the positive-electrode-metal-containing layer has a thickness of 0.1 to 10 nm.

3. A gallium nitride compound semiconductor light-emitting device according to claim 1 or 2, wherein the positive-electrode-metal-containing layer contains at least one metal selected from the group consisting of Pt, Ir, Rh, Pd, Ru, Re, and Os at a concentration of 0.01 to 30 at.% with respect to the total amount of metal atoms contained in the positive-electrode-metal-containing layer.

4. A gallium nitride compound semiconductor light-emitting device according to any one of claims 1 to 3,

wherein the positive electrode includes a reflecting layer on the contact metal layer, the reflecting layer comprising at least one metal selected from the group consisting of Pt, Ir, Rh, Pd, Ru, Re, Os, and Ag, or an alloy containing said at least one metal.

5           5.    A gallium nitride compound semiconductor light-emitting device according to claim 4, wherein the reflecting layer has a columnar crystal structure.

10           6.    A gallium nitride compound semiconductor light-emitting device according to claim 4 or 5, wherein the contact metal layer has a thickness of 1 to 30 nm.

15           7.    A gallium nitride compound semiconductor light-emitting device according to any one of claims 4 to 6, wherein the reflecting layer has a thickness of 30 to 500 nm.

20           8.    A gallium nitride compound semiconductor light-emitting device according to any one of claims 1 to 7, wherein the surface portion of the contact metal layer on the p-type semiconductor layer side includes a semiconductor-metal-containing layer that contains a Group III metal.

25           9.    A gallium nitride compound semiconductor light-emitting device according to claim 8, wherein the semiconductor-metal-containing layer further contains a nitrogen atom.

30           10.   A gallium nitride compound semiconductor light-emitting device according to claim 8 or 9, wherein the semiconductor-metal-containing layer has a thickness of 0.1 to 3 nm.

35           11.   A gallium nitride compound semiconductor light-emitting device according to any one of claims 8 to 10, wherein the semiconductor-metal-containing layer contains a Group III metal at a concentration of 0.1 to 50 at.% with respect to the total amount of metal atoms contained in the semiconductor-metal-containing layer.

          12.   A gallium nitride compound semiconductor light-emitting device according to any one of claims 1 to 11,

wherein the contact metal layer comprises Pt.

13. A gallium nitride compound semiconductor light-emitting device according to claim 12, wherein the contact metal layer has a Pt(222) plane spacing of 1.130 Å or less.

14. A gallium nitride compound semiconductor light-emitting device according to any one of claims 1 to 13, wherein the contact metal layer is formed through RF discharge sputtering.

15. A gallium nitride compound semiconductor light-emitting device according to any one of claims 4 to 13, wherein the contact metal layer is formed through RF discharge sputtering, and the reflecting layer is formed through DC discharge sputtering.

16. A method for producing a gallium nitride compound semiconductor light-emitting device according to any one of claims 1 to 15, wherein the gallium nitride compound semiconductor light-emitting device is maintained at a temperature of 350°C or less after a step of forming the contact metal layer.